

Description

ELECTRIC MEMBRANE SWITCH WITH SEVEN CONTACT POSITIONS

BACKGROUND OF INVENTION

[0001] An electric switch of mechanical structure and functioning and of electric contacts by means of membranes, suitable for optionally establishing different control signals by means of other such contact positions selectively induced on a single button means, four of these being differentiated positions when carrying out a slight rolling motion on said button means in any of four opposite directions and 90° equidistant from each other, a fifth contact position in its clockwise axial rotation, the sixth one by means of its counter-clockwise rotation, and a last contact position by means of a linear pulsating movement.

[0002] DESCRIPTION OF THE STATE OF THE ART

[0003] The use of different compact, electric or electromechanical switch devices is widely known, capable of establishing on demand different signals with which to control differ-

ent operations in distant, independent mechanisms or apparatuses.

[0004] For example, and from among a wide variety of them, electric control devices for positioning the glass plates of the outside rear-view mirrors on automobiles could be mentioned, which, by means of a single handling means, provide the optional rolling of said glass plate, pivoting from its central point in four directions, up, down, to the right and to the left, by which the user can choose and determine a suitable visual field according to his/her requirements. And there are even devices of this nature housing a fifth control, used for carrying out the folding and withdrawal of the mirror assembly, preventing it from projecting when its use is not needed, such as when the automobile is parked.

[0005] Another example of this type of devices could be the control lever used in computer game consoles, popularly known as "joystick", which, by means of its rolling and with the aid of one or more buttons strategically arranged on said lever, within reach of the user's hand, permits controlling the different actions with which to participate in the development of said games.

[0006] Many other embodiment examples could be mentioned in

which multiple switch devices such as those mentioned are used, but in the majority of the cases, they have certain limitations, either related to the fragility of the constitution thereof or to the restriction in the performances thereof.

[0007] DESCRIPTION

[0008] It is on the basis of the aforementioned, among other reasons and objects, that the invention concerning us has been proposed. In effect, the goal is to provide an electromechanical switch with a simple and efficient design, suitable for permitting the arrangement of seven different contact positions from a single common control shaft or member. Said switch is constituted by a series of heavy-duty mechanical elements cooperating together to carry out a selective and direct delivery of seven different signals coming from a single control member to a control signal generator means, capable of recognizing the nature of said signals and of emitting a corresponding and differentiated control signal for any purpose.

[0009] An object of the invention consists of providing said switch, in which the electronic parts are reduced just to the inclusion of contact means included in a membrane associated to a simple, integrated circuit board, the re-

maining parts being mechanical, providing it with a strong and resistant structure, and therefore long-lasting.

[0010] Another object of the invention is providing for said switch said electric contact means located in the cones fixed solidly to the membrane, and which have a contact wafer inside and in the lower part formed from a material with high conductivity, such as carbon, gold, etc. , which facilitates a suitably reliable connection.

[0011] A further purpose of the invention consists of providing said switch, in which the return operations to the initial positions of its movable parts are carried out by means of inducing its membrane's elastic memory, preventing the inclusion of accessory parts for this purpose except, as will be seen below, for the linear pulsating shift, for which return action a spring has been used.

BRIEF DESCRIPTION OF DRAWINGS

[0012] In order to facilitate understanding the electric membrane switch with seven contact positions, a figure is attached to the present patent application whose purpose is to better understand the principles on which the invention concerning us is based and to better understand the description of a preferred embodiment, keeping in mind that the character of the figure is illustrative and non-limiting.

[0013] Figure 1 shows a sequential exploded perspective view of the elements intervening in and constituting the switch of the invention, and in which its configuration as well as the arrangement of the parts thereof can be seen clearly.

DETAILED DESCRIPTION

[0014] The qualities and advantages of the invention will become evident for all those skilled persons in the art throughout the development of the following detailed description, which is carried out in relation to the attached figure, and which shows a currently preferred embodiment, from among other possible embodiments, of the switch concerning us, constituted from the descriptions of the present embodiment, which are provided with a purely illustrative and in no case limiting character.

[0015] With regard to the drawing, 11 designates a rectangular-shaped laminar membrane which has a central cone 12 on its upper surface solidly fixed to it, four cones 13a arranged in a diagonal position, each one in the direction of the corresponding corner of the membrane 11, and four other intermediate cones 13b in line with each two of the previous cones 13a; and all of them having a contact wafer inside, not shown in the drawing, suitable for selectively establishing contact with the circuits housed on a

printed circuit board 15 adjacently arranged on the lower surface of said membrane 11 and having its same extension.

[0016] In correspondence with each peripheral cone of the membrane, an actuator in pin form is seated which has a lower support base and has its upper end rounded, the four corner-arranged cones 14a provided for receiving the rotation movement impulse and the four intermediate cones 14b provided for receiving the rolling movement, as will be defined below.

[0017] The disclosed assembly is held in place by means of a base plate 16 provided with vertical cylindrical passages 18a and 18b corresponding to the arrangement of the cones 13a and 13b, as well as to the actuators 14a and 14b, respectively, permitting vertical shifting of the latter. A central passage 17 is arranged in the center of said base plate 16, which has a cylindrical section on its lower end, not shown, with a dimension similar to the diameter of the opening of the central cone 12 of membrane 11 on which it is seated, and an upper, square section for the purpose indicated below. Complementarily, on each longitudinal side, said base plate 16 has recesses 19 whose purpose will also be defined below.

[0018] A cylindrical piston 21, which has a transversal peripheral projection or square flange 22 on its upper part, as well as a lug 23 in upper axial projection, is housed on the square passage 15 of the base plate 16 by means of an enveloping spring 20, such that its lower end is in contact with the upper surface of the central cone 12 of membrane 11. Furthermore, this piston 21 can be provided with a central cavity where a LEC (light-emitting electrochemical cell) diode can be arranged for illumination.

[0019] A crosspiece 24 has four transversal arms 25 arranged at 90° from each other, whose ends have a linear cam surface 26a and 26b, on inclined plane and in a lower position, whose said inclined or cam plane is inverted with regard to the adjacent arm's cam plane, for a purpose which will be described below; and the center of said crosspiece 24 has a passage 27 with a square, truncated pyramid section suitable for being housed on the flange 22 of the piston 21, and for housing a rod 28 in its upper part.

[0020] The lower part of said cylindrical-shaped rod 28 is finished by means of a quadrangular enlargement 29 with a central cavity, not shown, by means of which it is supported and pivots on the lug 23 of the piston 21, and it is provided with a perimetral flap 30 and with a transversal

groove 31 on its upper end.

[0021] A laminar element in cap 32 form, having four downward pins 33 spaced 90° from each other, and having a passage 34 on its shaft by which it is introduced on the rod 28 until being seated on its flap 30, such that said pins 33 will be supported on the intermediate actuators 14b.

[0022] And a laminar body 35 element with an area similar to the areas of the membrane 11 and the printed circuit board 15 is provided with a dome-shaped bulking 36 with inner grooves 37 spaced 90° from each other, forming a lower cavity for being loosely housed on the cap 32 element, such that when the pins 33 of the cap are fitted inside of said grooves 37, they prevent its rotation, but said looseness permits the rolling of said cap 32, in the manner of a ball joint. A cross-shaped through cavity 41 is made on the zenith of dome 36, being suitable for housing it on the rod 28, and for permitting it to project and roll in the directions defined by the arms of the cross-shaped cavity 41.

[0023] Four solidly fixed cylindrical columns 38 project vertically downwards from the lower surface of said body 35 element close to its corners, having a length that will define and fix the position of the integrant assembly elements

when fixed by means of screws or the like to the membrane 11 and to its associated circuit board 15. In at least two of its opposite sides and close to its edge, two laminar bands 39 project downwards, being provided with a small triangular projection on their lower part and adjacent to their lower edge, suitable for being embedded in bayonet form on the lower edge of the base plate 16 and for holding the position of the element assembly arranged between the latter and the body 34. A small guide partition 40 centered on one of the side edges of the base element 35 projects downwards with a smaller length than the closure bands 39, being suitable for being coupled on the side recesses 19 of the base plate 16.

[0024] Lastly, a conventional control 42, which can be cylindrical or truncated pyramid, is tightly adjusted on the upper grooved 31 end of rod 28.

[0025] In this arrangement, membrane 11 is in contact by its lower part with the printed circuit board 15, whose cones 13a and 13b support the actuators 14a and 14b; the base plate 16, housed on said actuators, is supported on the opening of said cones, such that the ends of the actuators project above its upper surface; the piston 21 and its associated spring 20 are fitted over passage 17 of base

plate 16; crosspiece 24 housed on flange 22 of piston 21 permits the cam 26a and 26b surfaces of its arms to be supported on the corner actuators 14a; the rod 28 is pivotally supported on the lug 23 of the piston 21; the cap 32, housed on the rod 28, is seated on its peripheral flap 30 and with its pins 33 supported on the ends of the intermediate actuators 14b; and the body element 35 is covering the assembly and fixing its position by means of its fixing by bayonet embedding to the base plate 16 and by means of screws or any other similar means, by means of its columns 38, to the assembly formed by printed circuit board 15 and membrane 11, the upper grooved 31 end of the rod 28 projecting from the upper part of the dome 36 of the body element 34, upon which the control 40 is fitted.

[0026] Then, when a clockwise or counter-clockwise signal is given to said control 42, the latter transmits it to crosspiece 24 through rod 28, such that every two opposite arms 25, since the inclined plane cam surfaces are inverted, will press or will be distanced, respectively and according to the rotation direction, making the actuators 14a on which they are supported shift vertically, either those in two opposite corners or those of the other two

corners, those which in turn press on the cones 13a of the membrane 11, making them enter into electric fluid contact with the printed circuit board, which will emit a certain control signal. When the rotation impulse pressure stops, the cones of the membrane 11 will induce the crosspiece 24 to recover its initial position.

[0027] When the control 42 is induced into a rolling lateral shift in any of the four directions defined by the cross-shaped passage 41 of the dome 36 of the body 35 and fixed by the guide of the pins 33 of the cap 32 through the grooves 37 of said body 35, this movement is transmitted to the rod 28 which, pivoting on the lug 23 of the piston 21, makes the cap 32 shift like a ball joint, such that one of its pins 33 presses on the upper end of the corresponding intermediate actuator 14b, which acts as in the case of the rotational movement, in other words, pressing on the corresponding cone 13b of membrane 11 in order to make it enter into electric fluid contact with the printed circuit board, which will emit a differentiated control signal. And likewise, when the actuation on the control 42 stops, the cone will push the actuator, which in turn will press on the pin of the cap and will make it recover its initial position. And when linear pressure is carried out on

said control 42, the control transmits it to piston 21 through rod 28 which, counteracting the expansive action of spring 20, acts directly by pressing on central cone 12 of membrane 11, the same process being carried out as in the previous cases for the emission of a differentiated control signal, and, when said pressure stops, the elastic memory of spring 20 will make piston 21 recover its initial position and, consequently, the element assembly associated to it.

[0028] The invention, within its essence, can in practice be carried out in other embodiment forms only differing in details from the embodiment indicated as an example. It can be carried out in any shape and size, with the most suitable means and materials and with the most suitable accessories, the component elements can be replaced by other technically equivalent ones, for this all to remain comprised within the claims.